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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/719,025	11/24/2003	Fred J. Berkowitz	08935-290001 / M-5022	9154

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P.O. BOX 1022  
MINNEAPOLIS, MN 55440-1022

EXAMINER
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CHUO, TONY SHENG HSIANG

ART UNIT	PAPER NUMBER
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1745

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/15/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/719,025

Applicant(s)

BERKOWITZ ET AL.

Examiner

Tony Chuo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 December 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3, 15-24, 26-28, 32-36, 56-62 and 65-82 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 28, 32-36 and 74 is/are allowed.
- 6) ☒ Claim(s) 1-3, 15-17, 19-24, 26, 27, 56-62, 65, 66, 68-70 and 77-82 is/are rejected.
- 7) ☒ Claim(s) 3, 18, 67, 71-73, 75 and 76 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Amendment***

1. Claims 1-3, 15-24, 26-28, 32-36, 56-62, and 65-82 are currently pending. New claims 71-82 have been added. Claims 1-3, 15-24, 26-28, 32-36, 56-62, and 65-70 do overcome the previously stated 103 rejections. However, upon further consideration, claims 1-3, 15-24, 26-28, 32-36, 56-62, 65-70, and 77-82 are rejected under the following new 103 rejections.

### ***Claim Objections***

2. Claim 3 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The limitation "0.8-1.2% by weight of manganese" of claim 3 does not further limit the limitation "0.15% or less by weight of manganese" of claim 1.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-3, 15-17, 19-24, 26, 27, 56-57, 60-62, 65, 66, 68-70, and 77-82 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mikhaylik et al (US

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2003/0180611) in view of Tischer et al ("Candidate materials for the sulfur electrode current collector", Corrosion Science, Vol. 26, No. 5, pp. 371-375, 1986). The Mikhaylik reference discloses a primary lithium sulfur battery comprising: an anode including a lithium containing anode active material; a solid cathode including a current collector and a cathode active material in contact with the current collector; a separator between the anode and cathode; and a non-aqueous electrolyte in contact with the anode, the cathode, and the separator that includes an organic solvent and a perchlorate salt (See paragraphs [0065],[0130],[0139],[0147],[0148],[0152]). In addition, Mikhaylik et al also discloses a current collector that is an expanded metal grid which is a pulled, leveled grid (See paragraph [0130]). However, Mikhaylik et al does not expressly teach a current collector that includes an aluminum alloy that is a 6000 series aluminum alloy including 0.04-0.4% by weight of chromium, 0.01-6.8% by weight of copper, 0.1-7% by weight of magnesium, 0.15% or less by weight of manganese, and 0.4-0.8% by weight of silicon; an aluminum alloy including 0.15-0.4% by weight of copper, 0.7% or less by weight of iron, 0.8-1.2% by weight of magnesium, 0.1% or less by weight of titanium, and 0.25% or less by weight of zinc; a current collector that has a yield strength of at least 2.0 lb/in; a current collector that has a yield strength of at least 5 lb/in; a current collector that has a tensile strength of at least 5 lb/in; a current collector that has a tensile strength of at least 7 lb/in; a current collector that has a yield strength of at least 2.0 lb/in and a tensile strength of at least 5 lb/in; a current collector that has a resistivity of less than 10 mΩ/cm; and a current collector including a 6061 aluminum alloy. The Tischer reference discloses a positive current collector for a battery comprising a 6061 aluminum alloy (See Experimental Method). Examiner's note: A 6061 aluminum alloy

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has the following properties: tensile strength of 18100 psi, yield strength of 7980 psi, and a resistivity of  $3.7 \times 10^{-6}$  ohm-cm. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Mikhaylik battery to include a current collector that includes an aluminum alloy that is a 6000 series aluminum alloy including 0.04-0.4% by weight of chromium, 0.01-6.8% by weight of copper, 0.1-7% by weight of magnesium, 0.15% or less by weight of manganese, and 0.4-0.8% by weight of silicon; an aluminum alloy including 0.15-0.4% by weight of copper, 0.7% or less by weight of iron, 0.8-1.2% by weight of magnesium, 0.1% or less by weight of titanium, and 0.25% or less by weight of zinc; a current collector that has a yield strength of at least 2.0 lb/in; a current collector that has a yield strength of at least 5 lb/in; a current collector that has a tensile strength of at least 5 lb/in; a current collector that has a tensile strength of at least 7 lb/in; a current collector that has a yield strength of at least 2.0 lb/in and a tensile strength of at least 5 lb/in; a current collector that has a resistivity of less than 10 mΩ/cm; and a current collector including a 6061 aluminum alloy in order to utilize material that is highly corrosion resistant and has self-healing properties (See Tischer, pg. 375).

5. Claims 58 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mikhaylik et al (US 2003/0180611) in view of Tischer et al ("Candidate materials for the sulfur electrode current collector", Corrosion Science, Vol. 26, No. 5, pp. 371-375, 1986) as applied to claim 56 above, and further in view of Peled et al (US 4755440). However, Mikhaylik et al as modified by Tischer et al does not expressly teach a cathode active material that is a liquid or a cathode active material that includes SO<sub>2</sub> or SOCl<sub>2</sub>. The Peled reference does teach a lithium primary battery that has a liquid

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cathode and thionyl chloride and SO<sub>2</sub> (See column 1, lines 16-26). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Mikhaylik/Tischer battery to include thionyl chloride as the cathode active material in order to produce a higher energy density battery.

***Allowable Subject Matter***

6. Claims 28, 32-36, and 74 are allowed. Claims 18, 67, 71-73, 75, and 76 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Mikhaylik et al as modified by Tischer et al teaches a lithium battery comprising an anode including a lithium-containing anode active material that is lithium metal; a solid cathode including a current collector that includes an aluminum alloy and a cathode active material that is in contact with the current collector; a separator between the anode and the cathode; wherein the aluminum alloy that is a 6000 series aluminum alloy including 0.04-0.4% by weight of chromium, 0.01-6.8% by weight of copper, 0.1-7% by weight of magnesium, 0.15% or less by weight of manganese, and 0.4-0.8% by weight of silicon; an aluminum alloy including 0.15-0.4% by weight of copper, 0.7% or less by weight of iron, 0.8-1.2% by weight of magnesium, 0.1% or less by weight of titanium, and 0.25% or less by weight of zinc. However, Mikhaylik et al as modified by Tischer et al does not expressly teach a cathode active material that includes a manganese dioxide, a CF<sub>x</sub>, iron disulfide, a vanadate, metal oxides or metal halides.

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***Response to Arguments***

7. Applicant's arguments with respect to claims 1-3, 15-24, 26-28, 32-36, 56-62, and 65-70 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571) 272-0717. The examiner can normally be reached on M-F, 8:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC

  
JONATHAN CREPEAU  
PRIMARY EXAMINER